IN THE CLAIMS

Applicants respectfully request that the claims of the above-identified application be amended so as to read as follows whereby to place this application in condition for allowance, or at least in better form for Appeal, as required by 37 CFR 1.116:

1. (Currently Amended) An optical pickup projecting a collected beam onto a recording surface of an optical storage medium to retrieve recorded information by means of an intensity of reflection from the recording surface, said pickup correcting a first spherical aberration in an optical system by producing at correcting means a second spherical aberration which cancels the first spherical aberration,

said pickup being characterized in that:

the correcting means is capable of producing at least two second spherical aberrations of different magnitudes by means of a collected beam spot on the recording surface of the optical storage medium so that the magnitudes are 1/4 or more of a wavelength λ in differences between ~~peaks~~ maximum of measurement values and ~~valleys~~ minimum of the measurement values or 1/14 or more of a wavelength λ in standard deviation; and

said pickup comprises control means which: causes the correcting means to produce the at least two second spherical aberrations of different magnitudes; calculates an optimal magnitude of aberration correction for the first spherical aberration through a numeric evaluation based on an evaluation value of a reference signal obtained by receiving reflection of intensities in the presence of the spherical aberrations of such magnitudes; and controls the correcting means to carry out correction using the optimal magnitude of aberration correction.

2. (Original) The optical pickup as set forth in claim 1, wherein

in the numeric evaluation, the control means calculates an approximation
curve from the at least two second spherical aberrations of different magnitudes
produced by the correcting means and the evaluation value for these second spherical
aberrations and designates a peak or bottom position of the approximation curve as
the optimal magnitude of aberration correction.

3. (Original) The optical pickup as set forth in claim 2, wherein

the approximation curve is a multiple term approximation curve.

4. (Currently Amended) The optical pickup as set forth in claim 1, wherein

the control means:

causes the correcting means to produce the two second
spherical aberrations of different magnitudes so that the two second
spherical aberrations are separated by 1/2 or more of a wavelength λ
in differences between ~~peaks~~ maximum of measurement values and
~~valleys~~ minimum of the measurement values and that the second
spherical aberrations have substantially equal evaluation values;

calculates a mean value of the two magnitudes of the spherical
aberrations as the numeric evaluation; and

uses the mean value obtained in the mean value calculation as the
optimal magnitude of aberration correction.

5. (Currently Amended) The optical pickup as set forth in claim 1, wherein

the control means:

causes the correcting means to produce a second spherical aberration of

a first magnitude and a second spherical aberration of a second

magnitude which is separated by 1/2 or more of a wavelength λ in

differences between ~~peak~~ maximum measurement values and ~~valleys~~

minimum of the measurement values from the second spherical

aberration of the first magnitude so that the second spherical

aberration of the second magnitude can produce a reference signal

having an evaluation value substantially equal to that of a reference

signal obtained in the production of the second spherical aberration

of the first magnitude;

calculates a mean value of the second spherical aberrations of the first

and second magnitudes as the numeric evaluation; and

uses the mean value obtained in the mean value calculation as the

optimal magnitude of aberration correction.

6. (Original) The optical pickup as set forth in claim 1, wherein

the correcting means includes:

a liquid crystal panel containing a circular band of transparent electrode

provided on a liquid crystal layer filled with birefringent liquid

crystal; and

a liquid crystal drive circuit applying to the transparent electrode

voltages corresponding to the at least two second spherical

aberrations of different magnitudes.

7. (Original) The optical pickup as set forth in claim 1, wherein

the correcting means is a beam expander including a pair of lenses and capable of

producing the second spherical aberrations by varying a distance between the lenses.

8. (Original) The optical pickup as set forth in claim 1, wherein

    the correcting means is positioned on an optical path along which the beam projected onto the recording surface of the optical storage medium and the reflection from the recording surface travel.

9. (Original) The optical pickup as set forth in claim 1, wherein:

    the control means:

    causes the correcting means to produce a second spherical aberration of a first magnitude and a second spherical aberration of a second magnitude so that the second spherical aberration of the second magnitude can produce a reference signal having an evaluation value substantially equal to that of a reference signal obtained in the production of the second spherical aberration of the first magnitude;

    calculates a mean value of the second spherical aberrations of the first and second magnitudes as the numeric evaluation; and

    uses the mean value obtained in the mean value calculation as the optimal magnitude of aberration correction; and

    the first and second magnitudes are smaller than a maximum signal amplitude by 5% or more.

10. (Original) The optical pickup as set forth in claim 1, wherein:

    prior to adjustment of a focus offset, the control means:

    causes the correcting means to produce a second spherical aberration of a first magnitude and a second spherical aberration of a second magnitude so that the second spherical aberration of the second magnitude can produce a reference signal having an evaluation value substantially equal to that of a reference signal obtained in the production of the second spherical aberration of the first magnitude;

calculates a mean value of the second spherical aberrations of the first

and second magnitudes as the numeric evaluation; and

uses the mean value obtained in the mean value calculation as the

optimal magnitude of aberration correction; and

the first and second magnitudes are smaller than a maximum signal

amplitude by 10% or more.

11. (Original) The optical pickup as set forth in claim 1, wherein

the reference signal is an information signal read from the recording surface

of the optical storage medium, and an evaluation value of the reference signal

is an amplitude level.

12. (Original) The optical pickup as set forth in claim 1, wherein

the reference signal is a tracking error signal, and an evaluation value of the

reference signal is an amplitude level.

13. (Original) The optical pickup as set forth in claim 1, wherein

the reference signal is an information signal, and an evaluation value of the

reference signal is jitter.

14. (Original) The optical pickup as set forth in claim 1, wherein

the reference signal is an information signal, and an evaluation value of the

reference signal is an error rate.

15. (Currently Amended) A method of correcting a spherical aberration of an optical pickup,

        said method correcting a first spherical aberration in an optical system by producing a

        second spherical aberration which cancels the first spherical aberration when the

        pickup projects a collected beam onto a recording surface of an optical storage

        medium to retrieve recorded information by means of an intensity of reflection from

        the recording surface,

        said method being characterized in that it comprises the steps of:

        producing at least two second spherical aberrations of different magnitudes

                by means of a collected beam spot on the recording surface of the optical

                storage medium so that the magnitudes are 1/4 or more of a wavelength λ in

                differences between ~~peaks~~ maximum of measurement values and ~~valleys~~

                minimum of the measurement values or 1/14 or more of a wavelength λ in

                standard deviation;

        calculating an optimal magnitude of aberration correction for the first spherical

                aberration through a numeric evaluation based on an evaluation value of a

                reference signal obtained by receiving reflection of intensities in the presence

                of the spherical aberrations of such magnitudes; and

        correcting the first spherical aberration using the optimal magnitude of

                aberration correction.

16. (Currently Amended) A method of correcting a spherical aberration focus offset of an

optical pickup, said method correcting a spherical aberration and a focus offset in an

optical system when the pickup projects a collected beam onto a recording surface of

an optical storage medium to retrieve recorded information by means of an intensity

of reflection from the recording surface,

said method being characterized in that it comprises:

the step of recording a reference signal on the storage medium in a test

write area at a predetermined write power;

the step of reproducing the recorded information to obtain the reference

signal from the reflection;

the step of producing a first correction target in the presence of a

predetermined second correction target and changing the first

correction target using the reference signal, where the first correction

target is either one of the focus offset and the spherical aberration,

and the second correction target is the other one;

the optimal first correction target detection step of detecting an

occurrence condition of the first correction target when the first

correction target is a minimum;

the step of producing the second correction target under an occurrence

condition of the minimum first correction target and changing a

magnitude of the second correction target; and

the optimal second correction target detection step of detecting an

occurrence condition of the second correction target when the second

correction target is a minimum,

wherein the magnitude of the spherical aberration and the magnitude

of the focus offset obtained in the first correction target detection step

and the optimal second correction target detection step are used to

correct the spherical aberration and the focus offset.

17. (Currently Amended) A method of correcting a spherical aberration focus offset of an

optical pickup, said method correcting a spherical aberration and a focus offset in an

optical system when the pickup projects a collected beam onto a recording surface of

an optical storage medium to retrieve recorded information by means of an intensity

of reflection from the recording surface,

said method being characterized in that it comprises:

the step of recording a reference signal on the storage medium in a test

write area at a predetermined write power;

the step of reproducing the recorded information to obtain the reference

signal from the reflection;

the step of producing a spherical aberration in the presence of a

predetermined focus offset and changing a magnitude of the spherical

aberration using the reference signal;

the optimal spherical aberration detection step of detecting a spherical

aberration occurrence condition when the spherical aberration is a

minimum;

the step of producing a focus offset under the minimum spherical

aberration occurrence condition and changing a magnitude of the

focus offset; and

the optimal focus offset detection step of detecting a focus offset

occurrence condition when the focus offset is a minimum,

wherein the magnitude of the spherical aberration and the magnitude of

the focus offset obtained in the optimal spherical aberration detection

step and the optimal focus offset detection step are used to correct the

spherical aberration and the focus offset.

18. (Currently Amended) A method of correcting a spherical aberration focus offset of an

optical pickup, said method correcting a spherical aberration and a focus offset in an

optical system when the pickup projects a collected beam onto a recording surface of

an optical storage medium to retrieve recorded information by means of an intensity

of reflection from the recording surface,

said method being characterized in that it comprises:

the step of recording a reference signal on the storage medium in a test

write area at a predetermined write power;

the step of reproducing the recorded information to obtain the reference

signal from the reflection;

the step of producing a focus offset in the presence of a predetermined

spherical aberration and changing a magnitude of the focus offset

using the reference signal;

the optimal focus offset detection step of detecting a focus offset

occurrence condition when the focus offset is a minimum;

the step of producing a spherical aberration under the minimum focus

offset occurrence condition and changing a magnitude of the

spherical aberration; and

the optimal spherical aberration detection step of detecting a spherical

aberration occurrence condition when the spherical aberration is a

minimum,

wherein the magnitude of the spherical aberration and the magnitude of

the focus offset obtained in the optimal focus offset detection step

and the optimal spherical aberration detection step are used to correct

the spherical aberration and the focus offset.

19. (Original) The method as set forth in claim 16, wherein

a spherical aberration and/or a focus offset are produced which maximize an

amplitude of the reproduced signal.

20. (Original) The method as set forth in claim 16, wherein

a spherical aberration and/or a focus offset are produced which minimize a

jitter of the reproduced signal.

21. (Original) The method as set forth in claim 16, wherein

a spherical aberration and/or a focus offset are produced which minimize an

error rate of the reproduced signal.

22. (Original) An optical pickup including a correction device producing a

spherical aberration and a focus offset which cancel a spherical aberration and a focus

offset in an optical system for correction when said pickup projects a collected beam

onto a recording surface of an optical storage medium to retrieve recorded

information by means of an intensity of reflection from the recording surface,

said pickup being characterized in that said correction device comprises:

recording condition detecting means detecting a recording condition

recorded in advance on the optical storage medium;

test write means test-writing a predetermined signal in a test

write area of the optical storage medium under the recording

condition detected by the recording condition detecting means; and

correcting means executing: the process of producing a first correction

target in the presence of a predetermined second correction target and

changing the first correction target using a reproduction signal from

the test write area, where the first correction target is either one of the

focus offset and the spherical aberration, and the second correction

target is the other; the optimal first correction target detection process

of detecting an occurrence condition of the first correction target

when the first correction target is a minimum; the process of

producing the second correction target under an occurrence condition

of the minimum first correction target and changing a magnitude of

the second correction target; the optimal second correction target

detection process of detecting an occurrence condition of the second

correction target when the second correction target is a minimum;

and the process of using a magnitude of the spherical aberration and a

magnitude of the focus offset obtained in the first correction target

detection process and the optimal second correction target detection

process to correct the spherical aberration and the focus offset.

23. (Original) The optical pickup as set forth in claim 22, wherein

the correcting means is a beam expander including a pair of lenses and matches

a distance between the lenses to the magnitude of the spherical aberration

obtained in the optimal spherical aberration detection process.

24. (Original) The optical pickup as set forth in claim 22, wherein

the correcting means includes: a liquid crystal panel containing a circular band

of transparent electrode provided on a liquid crystal layer filled with

birefringent liquid crystal; and a liquid crystal drive circuit applying to the

transparent electrode voltages corresponding to the magnitude of the

spherical aberration obtained in the optimal spherical aberration detection

process.